REMARKS/ARGUMENTS

Claims 30-31, 59-60, 64, 66-79, 81-82, 87 and 89-104 remain in this application. Claims 1-29, 32-55, 56-58, 61-63, 65, 80, 83-86, 88, and 105 have been canceled. Claims 64 and 66-79 have been withdrawn.

The examiner has allowed claims 30-31, 59-60, 81-82 and 87.

Claims 64 and 66-89 have been withdrawn as the result of an earlier restriction requirement.

In view of the Examiner's earlier restriction requirement, applicant retains the right to present claims 64 and 66-79 in a divisional application.

General Discussion of the Relevant Prior Art

The claims have been rejected or objected to according to combinations primarily of three prior-art references, consisting of United States Patents to Triplett, Breed et al., and Margolis et al.. None of these references disclose or teach the basis of Applicant's invention: that the storage medium of pulsed energy generated by tire deformation be adapted to maximize the energy stored using a characteristic of the pulse energy itself. Triplett and Breed disclose generating power from tire deformation, and Margolis et al. discloses using pulse-width modulation to alter the energy before being stored. None of these references, singularly or in combination, suggest using the characteristics of the pulsed energy to optimize the energy storage medium. There is nothing in the art, apart from the applicant's disclosure, which suggests that these references be combined in the manner proposed.

Triplett (US 4,504,761) discloses a tire with piezoelectric elements deformed by the rotation of the tire and attached to a transformer to convert the generated electricity in some form for storage in a battery. No disclosure or suggestion is made of including a means of sensing the characteristics of the generated electricity and thusly modifying the operation of the transformer or other acquisition electronics to optimize the energy stored.

Breed et al. (US 6,662,642) discloses a variety of sensors in the tire to monitor the condition of the tire (pressure, temperature, acceleration, etc.) with the sensor information reported to an external interrogator using wireless communication. Although there is

mention made of generating electrical power from the deformation of the tire, Breed et al.does not disclose nor suggest including a means of sensing the characteristics of the generated energy and adapting to optimize the energy stored.

Margolis et al. (US 5,570,286) discloses generating energy from the motion of the suspension of a wheel, engine, passenger seat, or other suspended mass. The purpose of Margolis et al. is to control the generated energy in order to damp the suspended motion or vibration, and to feed back stored energy for further damping. The generated energy is provided by an energy transformer (e.g., a magnet and coil) coupled to the motion with its output going to an energy management unit and from there to an energy storage unit (e.g., a battery). Sensors are included, such as an accelerometer, to monitor the physical motion of the suspended mass and are used by a control unit to either draw from energy storage, or acquire the energy and send it to storage. When drawn from storage, the energy is sent to the energy transformer to cause it to impede the mass motion and increase damping. When acquiring energy from the energy transformer, the management unit imposes a pulse width modulation to enable/inhibit its acquisition; when energy flow is inhibited by the modulation, the energy transformer motion is impeded, and when not impeded the transformer motion is free. This pulse width modulation of the energy, and thus the transformer motion, provides further vibration damping by effectively modulating the load seen by the transformer. In Margolis et al., pulse width modulation does not sense the generated power pulse width, but is an active modulation imposed on the generated energy to control its flow. There is no mention made or suggestion of using the pulse width of the generated power itself to adapt the energy management to optimize the energy stored and, besides, the energy Margolis et al. is working with is the relative motion of suspension points that is not pulsed but more-or-less continuous; thus, there is no measurable pulse width.

Pulse-width modulation of a signal or power source involves the modulation of its duty cycle, to either convey information over a communications channel or control the amount of power sent to a load or, as in Margolis et al., to vary the load.

The Rejections Under 35 USC §103(a)

Claims 89, 92, 93, 94, 99, 102 and 103

The examiner rejected claims 89, 92, 93, 94, 102 and 103 as being obvious over US Patent No. 4,505,761 to Triplett in view of US Patent No. 6,662,642 to Breed et al.

Claim 89 is an independent claim; claims 92-94 depend on claim 89.

Claim 89 defines a device to generate pulsed electrical power from the deformation of a tire with energy capture electronics adapting to at least one characteristic of the pulsed power to optimize the captured energy. This aspect of Applicant's invention is not disclosed nor suggested by Triplett or Breed et al. either singularly or in combination.

Triplett takes direct current electrical power generated by tire-mounted piezoelectric transducers, routes the power to the vehicle body, converts the direct current to alternating current, sends the alternating current through a step-down transformer, and stores the power in a battery protected by a rectifying diode (Triplett, column 3, lines 30-44). Triplett discloses a direct current voltage source without storage optimization, whereas Applicant's device is pulsed with energy storage optimization using the pulse characteristics.

Breed et al. discloses the interrogator being the power source via RFID radiation (Breed et al. abstract, column 7 lines 23-25) or batteries (column 21 lines 59). Breed et al. also discloses using the flexure of the tire (column 22 lines 3-8) to generate power to be stored in one or more capacitors with no mention of whether this is direct current or pulsed. Breed does not disclose selecting the capacitor values to optimize storage, and storing electrical energy on capacitors is not novel.

Claims 92-94 depend on claim 89 and are to be construed as incorporating by reference all of the limitations of claim 89. Hence, since claim 89 distinguishes patentably from the prior art, claims 92-94 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

Further regarding claim 92, the claim specifies the adaptation characteristic as the voltage of the generated pulsed electrical power. This feature is not disclosed nor suggested by Triplett or Breed et al. either singularly or in combination.

Further regarding claim 93, this claim specifies the adaptation characteristic as the energy captured from the generated pulsed electrical power. This feature is not disclosed nor suggested by Triplett or Breed et al. either singularly or in combination.

Claim 99 is an independent claim; claims 102 and 103 depend on claim 99.

Claim 99 defines a method to generate pulsed electrical power from the deformation of a tire with energy capture electronics adapting to at least one feature of

the pulsed power to optimize the captured energy. This aspect is not disclosed nor suggested by Triplett or Breed et al. either singularly or in combination.

Claims 102 and 103 depend on claim 99 and are to be construed as incorporating by reference all of the limitations of claim 99. Hence, since claim 99 distinguishes patentably from the prior art, claims 102 and 103 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

Further to claim 102, this claim specifies that the adaptation feature as the voltage of the generated pulsed electrical power. This aspect is not disclosed nor suggested by Triplett or Breed et al. either singularly or in combination.

Further to claim 103, this claim specifies the adaptation feature as the energy captured from the generated pulsed electrical power. This aspect is not disclosed nor suggested by Triplett or Breed et al. either singularly or in combination.

For all of the above reasons, Applicant respectfully suggests that claims 89, 92-94, 99, 102, and 103 are not obvious over Triplett in view of Breed et al. and are allowable.

Claim 97

The examiner rejected claim 97 under 35 USC § 103(a) as being obvious over Triplett and Breed et al. as applied to claim 89 and further in view of US Patent No 6,462,650 to Balzer et al.

Claim 97 depends on claim 89 and is to be construed as incorporating by reference all of the limitations of claim 89. Hence, since claim 89 distinguishes patentably from the prior art, claim 97 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

For the foregoing reason, Applicant respectfully suggests that claim 97 is not obvious over Triplett, Breed et al., and Balzer et al. and is allowable.

Claims 98 and 105

The examiner rejected claims 98 and 105 under 35 USC § 103(a) as being obvious over Triplett, Breed et al., Balzer et al. as applied to claim 97 and further in view of US Patent No 5,573,611 to Koch et al.

Claim 105 has been canceled.

Claim 98 ultimately depends on claim 89 and is to be construed as incorporating by reference all of the limitations of claim 89. Hence, since claim 89 distinguishes patentably from the prior art, claim 98 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

For the foregoing reason, Applicant respectfully suggests that claim 98 is not obvious over Triplett, Breed et al., Balzer et al., and Koch et al. and is allowable.

Claim 95

The examiner rejected claim 95 under 35 USC § 103(a) as being obvious over Triplett and Breed et al. as applied to claim 89 and further in view of US Patent No 4,405,872 to Thomas.

Claim 95 depends on claim 89 and is to be construed as incorporating by reference all of the limitations of claim 89. Hence, since claim 89 distinguishes patentably from the prior art, claim 95 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

For the foregoing reason, Applicant respectfully suggests that claim 95 is not obvious over Triplett, Breed et al., and Thomas and is allowable.

Claims 90, 96, 100 and 104

The examiner rejected claims 90, 96, 100 and 104 under 35 USC § 103(a) as being obvious over Triplett and Breed et al. as applied to claims 89 and 99 further in view of US Patent No 5,570,286 to Margolis et al..

Claims 90 and 96 depend on claim 89 and are to be construed as incorporating by reference all of the limitations of claim 89. Hence, since claim 89 distinguishes patentably from the prior art, claims 90 and 96 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

Further regarding claim 90, this claim specifies the adaptation characteristic as the pulse width of the generated pulsed electrical power. This feature not disclosed nor suggested by Triplett nor Breed et al. nor Margolis et al. either singularly or in combination. Margolis et al. discloses using pulse width modulation (Margolis, abstract, column 2 line 57-column 3 line 4, column 6 lines 5-8) of the acquired energy to modulate its acquisition for generating vibration damping forces (abstract, column 2 lines 43-45). Acquired energy is stored for later for added damping. This feature is clearly different to Applicant's monitoring pulsed energy pulse width in order to adapt and maximize storage. Also, the energy Margolis et al. is working with is the relative motion of suspension points that is not pulsed, but more-or-less continuous oscillations, and there is no measurable pulse width.

Further regarding claim 96, this claim specifies the adaptation to be the selection of a combination of at least two capacitors. This feature is not disclosed nor suggested by Triplett nor Breed et al. nor Margolis et al. either singularly or in combination.

Claims 100 and 104 depend on claim 99 and are to be construed as incorporating by reference all of the limitations of claim 99. Hence, since claim 99 distinguishes patentably from the prior art, claims 100 and 104 must so similarly distinguish. *In re Fine*, 837 F.2d 1071, 5 USPQ2d, 1596, 1600 (Fed. Cir. 1988) ["Dependent claims are non-obvious if the independent claims from which they depend are non-obvious."].

Further to claim 100, this claim specifies the adaptation feature as the pulse width of the generated pulsed electrical power. This aspect is not disclosed nor suggested by Triplett nor Breed et al. nor Margolis et al. either singularly or in combination.

Further to claim 104, this claim specifies the adaptation to be the selection of a combination of at least two capacitors. This aspect is not disclosed nor suggested by Triplett nor Breed et al. nor Margolis et al. either singularly or in combination.

For all of the above reasons, Applicant respectfully suggests that claims 90, 96, 100 and 104 are not obvious over Triplett and Breed et al. in view of Margolis et al. and are allowable.

Allowable Subject Matter

The examiner objected to claims 91 and 101 as being dependent upon rejected base claims. Considering the above discussion, Applicant suggests that this objection has been overcome and further discussion has been rendered moot.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted

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Dated: December 1, 2006

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